

## **REMARKS**

### **Claim Rejections**

Independent Claims 1 to 4 and all their dependent claims 5-8, 12-15, 17-20, and 22-25 have been rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art asserted to be combined with Yoshikawa (JP 10114532), Butterbaugh et al. (U.S. patent 6,124,211), and Honma (JP 07-183240), and further with Hays (U.S. patent 3,511,727) for dependent claim features.

#### **a. Independent Claim 1**

Independent claim 1 has been amended to recite a method for producing a quartz glass jig that includes processing a quartz glass raw material into a desired shape of the quartz glass jig by a treatment including fire working, annealing a product of the desired shape so as to remove stress therein, and performing a cleaning treatment on the product to obtain a final product. A gas phase etching step and a gas phase purification step are performed on a surface layer of the product after the annealing but before the cleaning treatment. The gas phase purification step is carried out continuously after the gas phase etching step. The gas phase etching step is performed in a fluorine-containing gaseous atmosphere that contains at least one gas selected from the group consisting of  $C_xF_y$ ,  $Cl_xF_y$ ,  $N_xF_y$ ,  $Si_xF_y$ ,  $S_xF_y$  (where,  $10 \geq x \geq 1$  and  $10 \geq y \geq 1$ ),  $CHF_3$ ,  $HF$ , and  $F_2$ . The gas phase purification step comprises performing a high temperature heat treatment in a temperature range of from 800 to 1300 °C in a gaseous atmosphere containing Cl.

This method produces a quartz glass jig with a cleaner surface layer, and can be performed at low cost and with little extra labor. See specification, page 3, lines 10-20. The method of independent claim 1 as amended is not suggested by the cited prior art, and reconsideration of the rejection is respectfully requested.

The prior art methods described by applicant for producing a quartz glass jig with a surface layer that is almost free from metallic impurity were

1. cleaning the atmosphere in the chamber used to manufacture the quartz glass jig,
2. use of a flame burner of quartz glass, or
3. annealing in a furnace with a wall of a special clean material.

None of these prior-art approaches has been found sufficient, and none involve or suggest a gas phase etching step and a gas phase purification step after the annealing and before the cleaning treatment.

Yoshikawa describes a method of treating a jig of quartz glass with a solution of hydrofluoric acid that etches the surface of the jig. Yoshikawa however does not describe or suggest a gas-phase etching step, or a gas-phase purification in a chlorine-containing atmosphere, and does not suggest any step of the method of claim 1.

Butterbaugh teaches a method for removing contaminants from a silicon wafer, as contrasted with silicon dioxide, and clearly is not appropriately applied in the area of treatment of quartz glass articles. Butterbaugh treats silicon oxide as a contaminant to be completely removed. See Butterbaugh, col. 1, lines 13 to 21. One of skill in the art would therefore not consider application of Butterbaugh to a process for treating an article of quartz glass, i.e.,

silicon dioxide.

Butterbaugh also resists combination with the teaching of Yoshikawa, in that Butterbaugh directs one away from hydrofluoric acid treatments, and from the presence of water in the gaseous environment. See Buttebaugh, col. 5, lines 20 to 24 (“The present invention does not use HF oxide removal chemistry...”), and col. 3, lines 22 to 23 (“the gaseous environment being substantially free of water...”). Yoshikawa in contrast teaches a hydrofluoric acid solution necessarily containing water. The rejection therefore improperly combines these references.

Honma teaches a purification process using hydrogen chloride gas applied to disassembled parts. Honma, para. 11. Honma teaches away from applying the treatment to an assembled jig as recited in claim 1, and also fails to describe or suggest a gas etching step involving a fluorine-containing gaseous atmosphere. Honma therefore also does not suggest the claimed invention.

Hays describes general etching methods, and is cited to suggest use of hydrogen gas as a carrier and a dilutant of etching gas, which is not recited in claim 1 as amended.

Claim 1 as amended is therefore not suggested by the cited references, and those references cannot be properly combined to formulate the rejection. Reconsideration of the rejection of claim 1 is therefore respectfully requested.

Claims 5, 8 and 9 depend from claim 1 and therefore distinguish therewith over the prior art.

**b. Independent Claims 2, 3 and 4**

Independent claims 2, 3 and 4 have been amended similarly to claim 1, and all recite methods having the described gas-phase etching and gas-phase purification steps applied to an assembled quartz glass jig. For reasons similar to those expressed above with respect to claim 1, these claims also distinguish over the cited prior art, together with their dependent claims 12, 15, 16, 17, 20, 21, 22, 25 and 26.

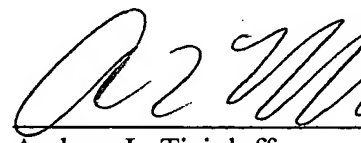
All claims having been shown to distinguish over the prior art in structure, function and result, formal allowance is respectfully requested.

Should any questions arise, the Patent Office is invited to telephone attorney for applicants at 212-490-3285.

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Respectfully submitted,



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